Arrangement for Fixing the Gas Generator of an Air Bag Unit

Specification

The present invention pertains to an arrangement for fixing the gas generator of an air bag unit, and in particular for fixing the gas generator in the generator chamber and for sealing the generator chamber against the environment. The present invention pertains to an air bag unit of typical design with an air bag housing, to which an air bag is fixed, and with a generator chamber connected to the air bag housing, which [generator chamber] accommodates the gas generator for releasing a gas that fills the air bag in case of a collision.

Air bag units with the basically above-described design belong to the state of the art. With regard to the large number of such safety means being found in some modern vehicles, these [safety means] have very different shapes and different embodiments in detail. With the increasing number of air bag units installed in a vehicle, these represent a cost factor that is of increasing consequence. With regard to production costs, therefore, efforts are being made to keep the design of air bag systems simple, and in particular also to reduce the number of their components, in order to finally reduce the costs with a lower [sic, "geringern" is an obvious typo for "geringeren" - Tr.] mounting effort in their assembly. Moreover, simplification measures of this type are desired with regard to the often highly limited space for components in the vehicle. One point to which attention is given here is the fastening of the gas generator in the generator housing. It is essential here to take several marginal conditions into account.

Thus, the gas generator must be securely fixed in position in the housing and, with regard to comfort, it must be made sure that vibrations and twistings resulting during the motion of the vehicle do not lead to rattling noises or squeaking noises due to parts rubbing against one another. Furthermore, the generator housing must be reliably sealed in order to prevent the gas that flows out of the generator for inflating the air bag in case of a collision from escaping out of the air bag unit into the environment in an uncontrolled manner. These requirements are to be met, taking into account the tolerances occurring in practice in relation to the dimensional stability of the components.

A special adapter for fixing the gas generator in the generator housing, which is utilized to meet the above-mentioned requirements, is described in EP 0 722 861 B1. The adapter is pushed onto the free axial end of the gas generator and fastened thereto by means of a frictional contact connection. For this, a plurality of axially sloping teeth are arranged on the circumference at the inner wall of the element, which has a hollow cylindrical shape. The adapter, which is open on one side for accommodating the gas generator, is fastened to the housing of the air bag unit by means of a flange arranged on the bottom, sealing this [bottom], by means of welding, soldering or gluing together. However, provided that additional sealing measures are not taken in the area of the flange, leakage problems may possibly occur with this solution in view of the frictionally engaged press fit of the gas generator and adapter. Also, it does not appear to be certain that the arrangement guarantees the necessary mechanical stability over the longer term in case of the stress occurring in practice.

An air bag unit, in which an elastic sealing and uncoupling ring is arranged between the gas generator and the air bag housing, is described by DE 197 43 615 A1. However, the solution is devoted, on the surface, to the radial uncoupling of the gas generator against the adjacent housing and the sealing of

the generator chamber. A compensation of radial tolerances between the gas generator and the generator chamber is advantageously achieved. In its basic embodiment, the sealing and uncoupling ring abuts against a stop shoulder at the axial end of the generator chamber. A fixing of the gas generator in the axial direction is not achieved in this embodiment by the ring alone. For this purpose, an additional cover is necessary or the ring must be embodied with an additional stopping means according to an embodiment of the solution described in the patent. Consequently, the axial fixing of the gas generator is achieved; however, the geometry of the sealing and uncoupling ring becomes more complicated. Moreover, tolerances of the axial measurements of the gas generator cannot or can hardly be compensated with this solution.

The object of the present invention is to provide a solution, by means of which the gas generator can be securely fixed in the generator chamber, and both radial and axial tolerances, in particular of the gas generator, can be compensated. At the same time, a reliable sealing of the generator housing against the environment shall be achieved.

The object is accomplished by an arrangement with the features of the main claim. Advantageous embodiments and variants of the present invention are given in the subclaims.

The suggested arrangement for fixing the gas generator of an air bag unit pertains to an air bag unit of this class having the usual construction, which essentially consists of an air bag housing with the inflatable air bag fixed therein, a generator chamber that is connected to the air bag housing, the gas generator being connected to a firing unit, as well as a diffuser. In a manner known per se, the gas generator, which is accommodated by the generator chamber, is mounted in a fixed bearing with an

axial end. The fixed bearing, whose embodiment is not a subject of the present invention, may, for example, be embodied by the inner contour of the generator chamber, which preferably consists of a plastic, which [inner contour] is adapted to the outer contour of the gas generator.

The present invention is used for fixing the gas generator at its free axial end lying opposite this fixed bearing. In a manner essential to the present invention, a plate-like, spring-elastic fastening element is pressed in this area between the outer circumference of the gas generator and the inner circumference of the generator chamber axially projecting through the gas generator. After the pressing in, the fastening element is arched into the generator chamber in the axial direction in a section between the outer wall of the gas generator and the inner wall of the generator chamber. As a result of this, the fastening element is pretensioned, such that it is supported, with its outer circumference, in a nonpositive manner against the inner wall of the generator chamber and thus clings to the inner wall. Thus, the fastening element at least partially embraces the bottom of the gas generator formed at this end and seals, in the case of a collision, the generator chamber against the environment with regard to the gas flowing out of the gas generator.

A reliable fixing of the gas generator in the generator chamber is achieved with the arrangement embodied in the manner described. Both the radial manufacturing tolerances of the gas generator or of the gas generator jacket and/or of the generator chamber and axial tolerances of the gas generator can be compensated without any problems by means of pressing on the plate-like fastening element, since the fastening element is quasi-automatically pushed open so wide during the pressing that it is arranged in a positive lock on the generator outer surface and clings to the inner surface of the generator chamber. Possible axial tolerances are compensated simply via the press-in depth of the fastening

element. Moreover, it is particularly advantageous that during the pressing, the fastening element is arched into the interior of the generator chamber in a radial section between the generator outer wall and the chamber inner wall, such that the gas generator is fixed in the generator chamber with a predetermined pretension. This is particularly an advantage with regard to the achieved sealing of the generator chamber, since, when the air bag is triggered, i.e., in case of the escape of gas from the gas generator and an increase in the internal pressure in the generator chamber connected therewith, the arching of the fastening element is pressed in the outward direction, and the fastening element, which consequently increasingly straightens as well as increases slightly in its diameter, clings even more rigidly to the chamber inner wall.

In one embodiment of the present invention, the fastening element, which is almost circular with regard to its outer contour, has an inner lug around its center in an inner area. Consequently, it is possible that the gas generator partially projects through the fastening element in the area of the inner lug. In this embodiment, the bottom of the gas generator has a graded contour in the axial direction, such that it [gas generator] projects through the inner lug of the fastening element in a radial inner area, but its bottom is nevertheless partially contained by the fastening element.

According to an advantageous embodiment of the arrangement according to the present invention, provisions are, moreover, made that the gas generator can be connected to the firing unit via a plug in the area of the inner lug embodied in the fastening element.

According to one possible embodiment, the fastening element is a stamped metal part made of sheet steel. Consequently, it is also possible to connect the gas generator in an electrically conductive

manner to the vehicle ground. For this purpose, a plug-in strap to be connected to the grounding strap is provided, for example, at the fastening element.

As a variant of this, it is, however, also possible to make the fastening element out of a composite material and to manufacture it, for example, out of a sheet steel, which is extrusion-coated about the inner lug of the fastening element and on the inner contour thereof with a plastic. Consequently, by means of a corresponding choice of the materials, the sealing behavior in the area of the generator bottom can, if necessary, still be improved, since the generator bottom is pressed into the plastic surrounding the inner lug during the pressing of the fastening element. According to a particularly advantageous embodiment of this variant, the fastening element can, moreover, be snapped onto the gas generator with its inner lug. As a result, it can already be premounted at the gas generator and inserted together with same into the generator chamber during the assembly of the air bag unit and pressed between the gas generator and the generator chamber.

According to a particularly advantageous variant, the fastening element has a microprofiled section on its outer circumference. Consequently, the clinging to the inner wall of the generator chamber is advantageously favored during the pressing of the fastening element. Preferably, microcorners or teeth are arranged distributed on the outer circumference of the fastening element for this purpose.

The essence of the present invention is again explained by means of the exemplary embodiments shown in the drawings. In the drawings,

Figure 1 shows the schematic view of a basic embodiment of the present invention,

Figure 2 shows a variant of the embodiment according to Figure 1.

Figure 1 shows the present invention in a schematic view according to a basic embodiment. The figure concerns only the cutaway portion of an air bag unit which is otherwise not further explained. It shows a part of the generator chamber 2 with the gas generator 1, likewise shown only partially, arranged therein. The remaining components of the air bag unit, whose design is well known, are not shown in the drawing. The diffuser, which is likewise not shown in this respect, which provides for a distribution of the gas stream for an inflation of the air bag that is as uniform as possible, can be embodied either at the generator 1 itself or/and by a corresponding profiled section of the inner wall of the generator housing 2.

In the example shown, the gas generator is embodied as an almost cylindrical part that is essentially rotationally symmetrical in relation to the longitudinal axis or the axial direction x. At its one axial end, which is not shown in the figure, the gas generator 1 is mounted in a fixed bearing. However, following the basic idea of the present invention, it is fixed at the opposite free axial end by means of the plate-like, spring-elastic fasting element 3 in the generator chamber 2. The fastening element 3, which has an inner lug 5 in its inner area in relation to the radial direction r, is pressed between the outer wall 10 of the gas generator 1 and the inner wall 20 of the generator chamber 2 during the insertion or after the insertion of the gas generator 1 into the generator chamber 2. The fastening element is thus installed in the area of its inner lug 5 at a section of the generator bottom 6, partially embracing same. At the same time, the plate-like part is arched into the interior of the generator chamber 2 in a section 4 between the generator outer wall 10 and the chamber inner wall 20, such that, in the installed state, it has a concave arch in relation to the x direction. Consequently, the gas

generator 1 is fixed in the generator housing under pretension. Thus, on its outer circumference, the fastening element clings to the inner wall 20 of the generator housing 1.

It is obvious that possible radial tolerances of the gas generator 1 and/or of the generator chamber 2 in connection with the pressing on the fastening element 3 and the shape of the fastening element, which is obvious from the drawing, being adjusted only during a preferably elastic deformation, can be compensated in a very simple manner. However, tolerances in relation to the axial dimensions of the gas generator 1 can, furthermore, also be easily compensated via the press-in depth of the fastening element 3.

The gas generator 1 can advantageously be connected to a firing unit, which is likewise not visible in the drawing, via the inner lug 5 by means of a plug, which is not shown here. In addition, it is possible by means of the inner lug 5 of the fastening element 3 that, as in the example shown, this [fastening element] is partially projected through by the gas generator 1 in the area of a gradation 7 of the generator outer contour.

The pretension achieved by the arching 4 of the fastening element 3 has an equally advantageous effect on the secure fixing of the gas generator 1 and the sealing of the generator chamber 2 against the escape of gas in the case of a firing of the gas generator 1. It can actually be observed that the fastening element 3 is pressed outwardly in the area of this arching, in case of an increase in the internal pressure of the generator chamber 2 occurring as a result of the escape of gas from the gas generator 1, towards the x direction shown by the arrow, extensively without changing its position, but while changing its shape, and by means of the responsive shape change as well as the generator chamber 2, clings even

more rigidly to the inner wall 20 thereof in a reliable sealing manner.

An embodiment of the arrangement according to the present invention which is somewhat modified compared to Figure 1 is shown in Figure 2. Here, the fastening element 3 is provided with a microprofiled section on its outer circumference. This is shown by the enlarged cutaway portion, viewed towards the x direction. In the example, microcorners 8 are arranged on the circumference of the fastening element 3. The clinging of the fastening element 3, which otherwise has the same design in relation to the clamping and sealing action, to the inner wall 20 of the generator housing 2 is favored by this structuring. As already shown, the fastening element 3 is embodied, for example, as a stamped metal part made of sheet steel. Consequently, it is possible, as in the example shown in Figure 2, to lay the gas generator 1 on the ground potential of the vehicle via a grounding strap 9 connected to other metallic parts of the vehicle.

However, it is also conceivable to manufacture the fastening element 3 from a composite material with an inner lug 5 bordered by plastic, whereby particularly this embodiment advantageously makes it possible to pretension the fastening element 3 by snapping on or clipping on at the gas generator 1.

List of Reference Numbers

1	Gas generator
2	Generator chamber
3	Fastening element
4	Arched section, arching
5	Inner lug
6	Bottom of the gas generator
7	Gradation
8	Microcorners
9	Grounding strap
10	Outer wall or surface of the gas generator
20	Inner wall or surface of the generator chamber